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Glossary

ALLUVIUM. Sedimentary material deposited by flowing water such as a river.

ALLUVIAL FAN. A cone-shaped deposit of alluvium made by a stream where it runs out onto a level plain.

AQUIFER. A water-bearing unit of permeable rock or soil that will yield water in usable quantities to wells. *Confined aquifers* are bounded above and below by less permeable layers. Groundwater in a confined aquifer is under a pressure greater than the atmospheric pressure. *Unconfined aquifers* are bounded below by less permeable material, but are not bounded above. The pressure on the groundwater in an unconfined aquifer at the top of the aquifer is equal to that of the atmosphere.

AQUITARD. A relatively impervious and semiconfining geologic formation that transmits water at a very slow rate compared to an aquifer.

BACKGROUND RADIATION. Includes both natural and manmade radiation such as cosmic radiation and radiation from naturally radioactive elements and from commercial sources and medical procedures.

BECQUEREL (BQ). A unit of radioactivity equal to one nuclear transformation per second.

CLASS A, B, AND C LOW-LEVEL WASTE. Waste classifications from the Nuclear Regulatory Commission's 10 CFR Part 61 rule. Maximum concentration limits are set for specific isotopes. Class A waste disposal is minimally restricted with respect to the form of the waste. Class B waste must meet more rigorous requirements to ensure physical stability after disposal. Greater concentration limits are set for the same isotopes in Class C Waste and it also must meet physical stability requirements. Moreover, special measures must be taken at the disposal facility to protect against inadvertent intrusion.

CONFIDENCE COEFFICIENT OR FACTOR. The chance or probability, usually expressed as a percentage, that a confidence interval includes some defined parameter of a population. The confidence coefficients usually associated with confidence intervals are 90%, 95%, and 99%.

COSMIC RADIATION. High-energy subatomic particles from outer space that bombard the earth's atmosphere. Cosmic radiation is part of natural background radiation.

COUNTING ERROR. The variability caused by the inherent random nature of radioactive disintegration and the detection process.

CURIE(CI). A unit of radioactivity equal to 37 billion (3.7×10^{10})nuclear transformations per second.

DETECTION LEVEL. The minimum concentration of a substance that can be measured with a 99% confidence that the analytical concentration is greater than zero.

DERIVED CONCENTRATION GUIDE (DCG). Concentrations of radionuclides in air and water in which a person continuously exposed and inhaling 8400 m^3 of air or ingesting 730 liters of water per year would receive an annual effective dose equivalent of 100 mrem per year from either mode of exposure. The committed dose equivalent is included in the DCGs for radionuclides with long half-lives. (See Appendix B)

DISPERSION. The process whereby solutes are spread or mixed as they are transported by groundwater as it moves through sediments.

DOSIMETER. A portable device for measuring the total accumulated exposure to ionizing radiation.

DOWNGRADIENT. The direction of water flow from a reference point to a selected point of interest. (See GRADIENT)

EFFECTIVE DOSE. See "Effective Dose Equivalent" under "Radiation dose."

EFFLUENT. Flowing out or forth; an outflow of waste. In this report, effluent refers to the liquid or gaseous waste streams released into the environment from the facility.

EFFLUENT MONITORING. Sampling or measuring specific liquid or gaseous effluent streams for the presence of pollutants.

EXPOSURE. Subjecting a target (usually living tissue) to radiation.

FALLOUT. Radioactive materials mixed into the earth's atmosphere. Fallout constantly precipitates onto the earth.

GRADIENT. Change in value of one variable with respect to another variable, especially vertical or horizontal distance, e.g., gravity, temperature, magnetic intensity, electric potential.

GROUNDWATER. Subsurface water in the pore spaces of soil and geologic units.

HALF-LIFE. The time in which half the atoms of a radionuclide disintegrate into another nuclear form. The half-life may vary from a fraction of a second to thousands of years.

HIGH-LEVEL WASTE (HLW). The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations sufficient to require permanent isolation.

HYDRAULIC CONDUCTIVITY. The ratio of flow velocity to driving force for viscous flow under saturated conditions of a specified liquid in a porous medium; the ratio describing the rate at which water can move through a permeable medium.

ION. An atom or group of atoms with an electric charge.

ION EXCHANGE. The reversible exchange of ions contained in a crystal for different ions in solution without destroying the crystal structure or disturbing the electrical neutrality.

ISOTOPE. Different forms of the same chemical element that are distinguished by having different numbers of neutrons in the nucleus. An element can have many isotopes. For example, the three isotopes of hydrogen are protium, deuterium, and tritium.

KAME DELTA. A conical hill or short irregular ridge of gravel or sand deposited in contact with glacier ice.

LACUSTRINE SEDIMENTS. A sedimentary deposit consisting of material pertaining to, produced by, or formed in a lake or lakes.

LEACHED HULLS. Stainless steel cladding that remains after acid dissolution of spent fuel.

LOW-LEVEL WASTE. Radioactive waste not classified as high-level waste, transuranic waste, spent fuel, or uranium mill tailings. (See Class A,B,C low-level waste).

MAXIMALLY EXPOSED INDIVIDUAL. A hypothetical person who remains in an uncontrolled area who would, when all potential routes of exposure from a facility's operations are considered, receive the greatest possible dose equivalent.

MEAN. The average value of a series of measurements.

MILLIREM (MREM). A unit of radiation dose equivalent that is equal to one one-thousandth of a rem. An individual member of the public can receive up to 500 millirems per year according to DOE standards. This limit does not include radiation received for medical treatment or the 100 to 360 mrem that people receive annually from background radiation.

MINIMUM DETECTABLE CONCENTRATION. The smallest amount or concentration of a radioactive or nonradioactive element that can be reliably detected in a sample.

MIXED WASTE. A waste that is both radioactive and hazardous.

OUTFALL. The end of a drain or pipe that carries waste water or other effluents into a ditch, pond, or river.

PARTICULATES. Solid particles and liquid droplets small enough to become airborne.

PERSON-REM. The sum of the individual radiation dose equivalents received by members of a certain group or population. It may be calculated by multiplying the average dose per person by the number of persons exposed. For example, a thousand people each exposed to one millirem would have a collective dose of one person-rem.

PLUME. The distribution of a pollutant in air or water after being released from a source.

PROGLACIAL LAKE. A lake occupying a basin in front of a glacier; generally in direct contact with the ice.

RAD. Radiation absorbed dose. One hundred ergs of energy absorbed per gram.

RADIATION. The process of emitting energy in the form of rays or particles that are thrown off by disintegrating atoms. The rays or particles emitted may consist of alpha, beta, or gamma radiation.

- ALPHA RADIATION. The least penetrating type of radiation. Alpha radiation can be stopped by a sheet of paper or outer dead layer of skin.

- BETA RADIATION. Electron emitted from a nucleus during fission and nuclear decay. Beta radiation can be stopped by an inch of wood or a thin sheet of aluminum.

- GAMMA RADIATION. A form of electromagnetic, high-energy radiation emitted from a nucleus. Gamma rays are essentially the same as x-rays and require heavy shielding such as lead, concrete, or steel to be stopped.

- INTERNAL RADIATION. Radiation originating from a source within the body as a result of the inhalation, ingestion, or implantation of natural or manmade radionuclides in body tissues.

RADIATION DOSE.

- ABSORBED DOSE. The amount of energy deposited by radiation in a given amount of material. Absorbed dose is measured in rads.

- COLLECTIVE DOSE EQUIVALENT. The sum of the dose equivalents for individuals comprising a defined population. The per capita dose equivalent is the quotient of the collective dose equivalent divided by the population size. (See PERSON-REM).

- COMMITTED DOSE EQUIVALENT (dose commitment). The total dose equivalent accumulated in an organ or tissue in the fifty years following a single intake of radioactive materials into the body.

- CUMULATIVE DOSE EQUIVALENT. The total dose one could receive in a period of fifty years following release of radionuclides to the environment, including the dose that could occur as a result of residual radionuclides remaining in the environment beyond the year of release.

- DOSE EQUIVALENT. The product of the absorbed dose, the quality factor, and any other modifying factors. The dose equivalent is a quantity for comparing the biological effectiveness of different kinds of radiation on a common scale. The unit of dose equivalent is the rem.

- EFFECTIVE DOSE EQUIVALENT. An estimate of the total risk of potential health effects from radiation exposure. It is the sum of the committed effective dose equivalent from internal deposition and the effective dose equivalent from external penetrating radiation received during a calendar year. The committed effective dose equivalent is the sum of the individual organ committed dose equivalents (fifty years) multiplied by weighting factors that represent the proportion of the total random risk that each organ would receive from uniform irradiation of the whole body.

RADIOACTIVITY. A property possessed by some elements such as uranium whereby alpha, beta, or gamma rays are spontaneously emitted.

RADIOISOTOPE. A radioactive isotope of a specified element. Carbon-14 is a radioisotope of carbon. Tritium is a radioisotope of hydrogen.

RADIONUCLIDE. A radioactive nuclide. Radionuclides are variations (isotopes) of elements. They have the same number of protons and electrons but different numbers of neutrons, resulting in different atomic masses.There are several hundred known nuclides, both man-made and naturally occurring.

REM. An acronym for Roentgen Equivalent Man. A unit of radiation exposure that indicates the potential effect on human cells.

SIEVERT. A unit of dose equivalent from the International System of Units equal to one joule per kilogram.

SPENT FUEL. Nuclear fuel that has been exposed in a nuclear reactor; this fuel contains uranium, activation products, fission products, and plutonium.

STANDARD DEVIATION. An indication of the dispersion of a set of results around their average.

THERMOLUMINESCENT DOSIMETER (TLD). A material that luminesces upon heating after being exposed to radiation. The amount of light emitted is proportional to the amount of radiation to which it has been exposed.

UPGRADIENT. Referring to the flow of water or air, it is analogous to upstream. A point that is "before" an area of study that is used as a baseline for comparison with downstream data. See GRADIENT and DOWNGRADIENT.

WATERSHED. The area contained within a drainage divide above a specified point on a stream.

WATER TABLE. The upper surface in a body of groundwater. The surface in an unconfined aquifer or confining bed at which the pore water pressure is equal to atmospheric pressure.

WHOLE-BODY DOSE. A radiation dose that involves exposure of the entire body.

Abbreviations for Units of Measure

Radioactivity

Symbol	*Name*
Ci	curie
mCi	millicurie (1E-03 Ci)
μCi	microcurie (1E-06 Ci)
nCi	nanocurie (1E-09 Ci)
pCi	picocurie (1E-12 Ci)
fCi	femtocurie (1E-15Ci)
aCi	attocurie (1E-18 Ci)
Bq	becquerel (27 pCi)

Volume

Symbol	*Name*
cm^3	cubic centimeter
L	liter
mL	milliliter
m^3	cubic meter
ppm	parts per million
ppb	parts per billion

Dose

Symbol	*Name*
Sv	sievert (100 rems)
Gy	gray (100 rads)

Time

Symbol	*Name*
y	year
d	day
h	hour
m	minute
s	second

Length

Symbol	*Name*
m	meter
km	kilometer (1E + 03 m)
cm	centimeter (1E-02 m)
mm	millimeter (1E-03 m)
μm	micrometer (1E-06 m)

Area

Symbol	*Name*
ha	hectare (10,000 m^2)

Mass

Symbol	*Name*
g	gram
kg	kilogram (1E + 03 g)
mg	milligram (1E-03)
μg	microgram(1E-06 g)
ng	nanogram (1E-09 g)
t	metric ton (10^3 kg)

Conversion Table

Multiply	*by*	*To obtain*	*Multiply*	*by*	*To obtain*
in.	2.54	cm	cm	0.394	in.
ft	0.305	m	m	3.28	ft.
mi	1.61	km	km	0.621	mi
lb	0.454	kg	kg	2.205	lb
liq. qt.	0.946	L	L	1.057	liq. qt.
ft^2	0.093	m^2	m^2	10.76	ft^2
ha	2.47	acres	acres	0.405	ha
mi^2	2.59	km^2	km^2	0.386	mi^2
ft^3	0.028	m^3	m^3	35.7	ft^3
dpm	0.450	pCi	pCi	2.22	dpm
nCi	1000	pCi	pCi	0.001	nCi
pCi/L	1E-09	μCi/mL	μCi/mL	1E+09	pCi/L
pCi/m^3	1E-12	Ci/m^3	Ci/m^3	1E+12	pCi/m^3
becquerel	2.7E-11	curie	curie	3.7E+10	becquerel
gray	100	rad	rad	0.01	gray
sievert	100	rem	rem	0.01	sievert
ppb	0.001	ppm	ppm	1000	ppb
ppm	1.0	mg/L	mg/L	1.0	ppm

Unit Prefixes

Factor	*Prefix*	*Symbol*
1E+09	giga	G
1E+06	mega	M
1E+03	kilo	k
1E-02	centi	c
1E-03	milli	m
1E-06	micro	μ
1E-09	nano	n
1E-12	pico	p

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